

# the apro bulletin

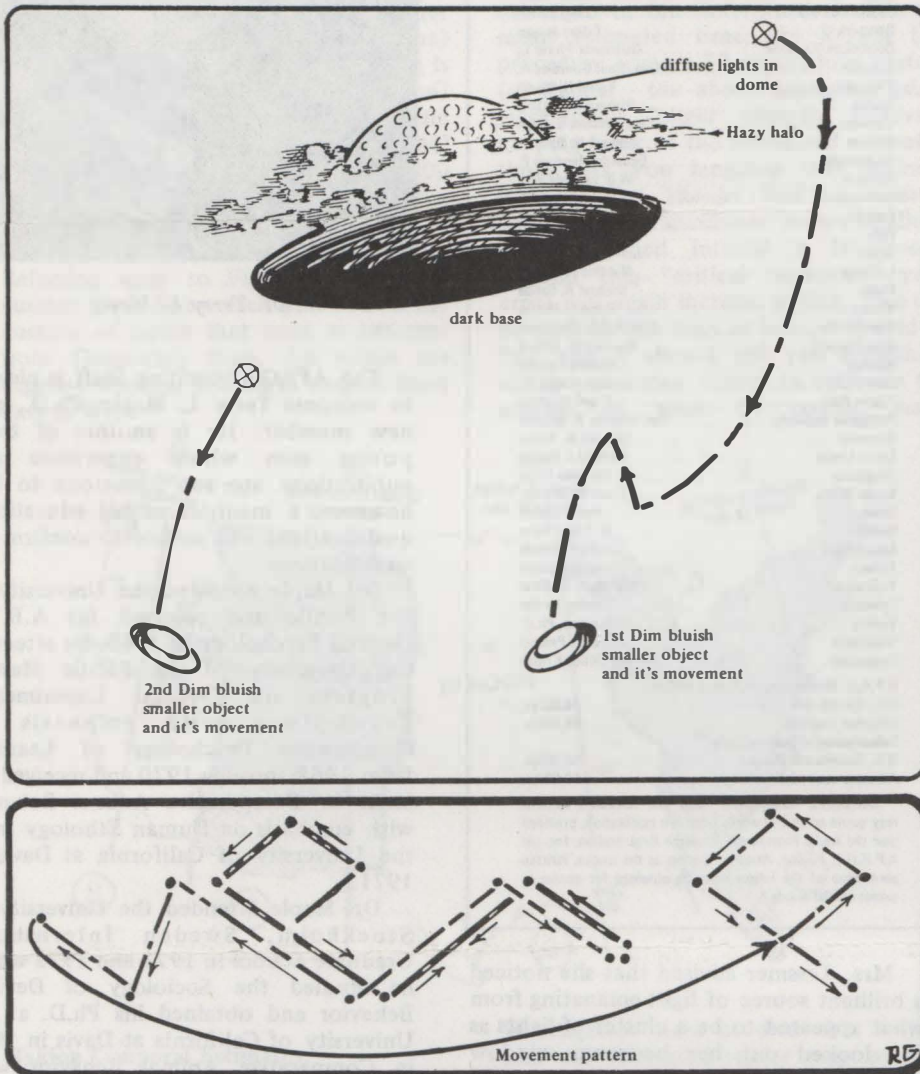
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VOL. 23, NO. 7

TUCSON, ARIZONA

MAY 1975

## TUCSON AREA HAS MINI FLAP



*Objects and flight patterns in Robbins Case — See Col. 3*

### UFO Sighted In Philippines

The Reverend Angel Hidalgo, Head of the Archives of the Manila Observatory, Philippines, has reported that at 9:30 p.m. on February 28th, he observed what he termed to be an unidentified flying object from the roof of the observatory. He later described the object as "approximately tear-shaped, with a spherical front part while the rear part was conical. The front part was whitish, while there were semicircular arcs of

different colors toward the rear. The boundaries were not nebulous but well-defined."

Fr. Hidalgo said that he noticed the strange object a few minutes after the moon had risen over the hills of Antipolo. "I was on the observation deck of the Manila Observatory where I had a completely unobstructed view of Marikina Valley and the mountain range to the east," he said. "I had followed the rising of the moon and was deep in my thoughts recalling the lecture attended earlier in the day when suddenly there

*(See Philippines — Page Three)*

During the first 15 days of May, 1975, APRO Headquarters was informed of several sightings which took place in the general area of Tucson. The two cases which are presented here have been investigated and others including one involving possible communication are pending.

On the 7th of May at 9:00 p.m. Miss Ruby Lopez was driving her sister Tina, brother Arthur and two neighbor boys, the Marzoni children, home when they all saw a strange sight. They were driving north up Sunrock Drive in west Tucson in the Tucson Mountain foothills about 6 miles from the downtown area in the Lopez Volkswagon sedan. They stopped at the fork to let the Marzoni boys off when Ruby noticed some lights and called the attention of her brother and sister to them. They were four bright white lights with a bluish cast to them which looked like large stars except that they were all in a row above and to the north of a house to their left and west. They wondered what they could have been and Ruby said, "I'm curious; we're going to find out what it is," and headed the car up a road which curved west toward the lights. As the headlights swung in the direction of the lights an additional red light came on behind them, flashed 3 times in rapid succession, paused, and then flashed 3 times again.

Miss Lopez guided the car around the long turn back through the south to southeast and the object was now behind the car. The lights had now come closer and they could see that the lights were on the front of an oval body of an indistinct dark color. The color of the lights were also described as silverish-white. After observing from closer range the quartet felt that the red light had come from the rear or lower center; however, that light did not reappear. The object remained at a tilted angle of about 25 to 30 degrees with the lower edge, which contained the four bright lights, down and forward. This tilt angle was maintained throughout the sighting.

At this point the object began to follow the car down the winding dirt road toward a house about a quarter mile away. As it did so, the lights became brighter and Ruby asked Tina if she had

*(See "Tucson" — Page Three)*



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## New Consultant



Dr. Terry L. Maple

The APRO Consulting Staff is pleased to welcome Terry L. Maple, Ph.D., as a new member. He is another of those young men whose experience and publications are too numerous to list; however, a mention of his educational qualifications will suffice to confirm his qualifications.

Dr. Maple attended the University of the Pacific and received his A.B. in General Psychology in 1968. He attended the University of the Pacific Masters Program on General Experimental Psychology with emphasis on Comparative Psychology of Learning from 1968 through 1970 and received his M.A. in Comparative Animal Behavior with emphasis on Human Ethology from the University of California at Davis in 1971.

Dr. Maple attended the University of Stockholm, Sweden International Graduate School in 1971 and 1972 where he studied the Sociology of Deviant Behavior and obtained his Ph.D. at the University of California at Davis in 1974 in Comparative Animal Behavior with emphasis on Social-Emotional Behavior of Nonhuman Primates.

Considerable teaching and research has been done by Dr. Maple, both at undergraduate and graduate levels. He has served on many committees and is currently chairman of the Research Committee of the San Diego (California) Zoo. He has published many papers and is a member of Sigma Xi, University of California at Davis chapter. Included in his many affiliations is the American Association for the Advancement of Science. Dr. Maple is currently engaged in research on behavioral biology of

## "Cluster" UFO Over Arizona

A UFO was observed in the Paradise Valley area of Arizona at 4:30 a.m. on July 22, 1974 by Mrs. Dorothy Tessmer, her son Alan, 16, and her daughter Ann, 24.

Mrs. Tessmer informed me that she was unable to sleep that evening and that she was restless. It had rained during the night and the outside temperature had dropped off enough to turn off the air-conditioning and open the windows. The window in the bedroom was open and the drapes were open to let in the cool air, which was a relief from the hot air that normally prevails at this time of year.

Mrs. Tessmer advised that she noticed a brilliant source of light emanating from what appeared to be a cluster of lights as she looked out her bedroom window which faces the northeast. Since the light source was at a relatively steep angle in relation to the window, the witness said that it was only visible for two or three minutes before it left her field of view. She called to her son Alan, who also observed the light source for a very short period before it was no longer visible from the bedroom window.

Once they left the bedroom and went out in the backyard, the object could again be clearly seen. By this time, Mrs. Tessmer's daughter Ann had been awakened and was also watching the celestial phenomena which still appeared as a bright clump of lights at a 30-degree

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(See Consultant - Page Three)



## "Tucson"

(Continued from Page One)

her camera. The object came down closer and they saw a dim glow on the underside. It was almost over the car when Ruby braked to a stop, turned off the headlights and said, "camera". Tina tried to shoot up through the rolled down window but had to open the door and lean out to shoot the first picture. The car had stopped almost in front of a house trailer, heading southeast. Tina was shooting to the southeast and up at an 80 degree angle.

The thing began to slow down and Ruby told Tina to close the door. However, Tina said, "Wait a minute, I have another flash", and stepped out and shot the second picture as the object began slowly moving away. It had hovered momentarily over a big cactus in front of the car. The object was then about 300 feet above and slightly beyond the cactus. They estimated the size of the object as a little larger than the Volkswagon. The object continued to move toward the southeast toward "A" mountain, passing almost directly over a castle-like home on the way. It began to pick up speed as it left and disappeared in the direction of "A" mountain, 6 miles away in about 20 seconds.

The two girls agree that the white lights were very large and diffuse like the lights in an operating room and not at all like auto headlights. After the car engine stopped they heard a smooth, quiet, low-pitched hum unlike anything they had heard before. The white lights pulsed dimmer and brighter for a moment as it hovered over the cactus.

The part of the sighting during which the photos were taken took place in a rather dusty area and the negatives showed nothing except the volkswagon door and light bouncing off the dust in the air.

Another report came in to Headquarters four days later on the 11th from Donna and Jim Robbins who reported the following: At about 8:15 p.m. Mr. Marty Martinez called and said that he and his son Ricky were watching a strange light in the sky to the southwest and suggested that the Robbins' take a look at it. The light was flashing red, white, green, yellow, blue and violet in a random sequence and in no particular order. The colored lights seemed to blend from one color to another rather than blinking off and on and were more diffused than brilliant. Mostly one color was showing at a time and seldom more than two. Mr. Martinez, a qualified observer, estimated that the object was 3,000 to 4,500 feet above the ground. The Martinez family lives about five doors away and across the street from the Robbins residence.

Mr. Martinez' son Ricky, a soldier stationed at Fort Huachuca, was home on leave at the time and was watching it with his father but went into the house and called Davis Monthan Air Force Base and reported the observation and they told him to watch it and report back. They also told him not to try to chase it as the roads would be blocked.

Mrs. Robbins, determined to view the object more closely, picked up Marty Martinez and his daughter Lupita in her car and they took I-19 to Valencia Street and on out to Mission Road for a better view. (Incidentally, no roads were blocked off.) The object seemed to remain in the same position, blinking continuously. They stopped at Mission Road, two miles from the first position at their homes and found that the object seemed to be only a half mile away. They noticed that it was now slowly moving west. They got back in the car and drove to Mark Road. A jet interceptor aircraft came overhead and passed to the northeast of the object.

At this point the object began to rise slowly and the lights went out momentarily and then came back on again and then it began to move west faster. They turned off Valencia onto Mark Road and pulled in to Mossman to use a telephone. Marty, who was watching the object through the binoculars could see the object quite clearly and described it as bright and derby-hat-shaped. It also seemed to be closer as though they were gaining on it and covered a measurement of 5/8 inches at arm's length (Editor's Note: In view of the fact that binoculars were needed to see detail it is not likely that the object covered 5/8 inch at arm's length).

At this point Martinez noticed a smaller point of light below the bright object and a second one to the left and higher than the first. These objects were flat disc-shapes of a dim blue color. The brighter derby hat-shaped object had the colored lights scattered all over the curved dome surface and they continued to blend in and out in random sequence. The dome was surrounded by a thin haze or halo of some kind about mid-way of its height. This halo stood away from the surface of the craft and did not touch it but it always maintained its position.

The larger object then began to move in a vertical diamond pattern, then it began to trace a vertical zig-zag pattern in the west, retraced the same pattern back to the east, made the diamond pattern again and started all over again repeatedly. All the while the whole formation was moving westward at over 80 miles per hour as it was drawing away from the witnesses.

The witnesses then got back into the car and came back to Valencia Street and turned west on Valencia and on out to Ryan Field. The object and the smaller points of light continued moving west

faster than the car could travel.

The little party stopped at Mrs. Dolly Forren's home near the road by Ryan Field to get them to witness the object but the Forrens were not at home. However, the two teen-age daughters were there and they and a couple of neighbors came out to see it. It was still making the same patterns and continued moving west. The right hand lower light rose to the right past the larger object until it was above it. The second one, to the left, remained below but rose closer to the larger object.

The party got back into the car and followed the object further west to Three Points, about 12 or 13 miles beyond Ryan Field and still had it in sight for 8 or 9 minutes as it withdrew from them to the west. They lost sight of it at Sandario.

The total viewing time for this case is one hour and fifteen minutes and took place in an area which has been a "hot bed" of UFO reports in the past. At the current writing investigation is being carried out concerning a landed object which was viewed by several people over a period of about 3 hours during which time alleged communication between one of the witnesses and the object is claimed. This latter sighting took place within just a few miles of where Mrs. Robbins and Mr. Martinez and party were located when they lost sight of the object on May 11th, and began just four hours later.

\* \* \* \* \*

## "Philippines"

(Continued from Page One)

appeared the beautiful sight."

The "glowing spherical object" was due east of the observatory, moved in a northerly direction parallel to and against the mountain range at an estimated one kilometer above the valley. No sound was heard and the object was observed for only a few seconds.

APRO Representative Aderito A. DeLeon has interviewed Fr. Hidalgo and has learned that there are other witnesses whom he will interview and forward the ensuing reports. We thank George Guy for sending the initial information on this case.

\* \* \* \* \*

## Consultant

(Continued from Page Two)

nonhuman primates at the Department of Behavioral Psychology, Department of Psychology, University of California at Davis.

\* \* \* \* \*



## "Cluster"

(Continued from Page Two)

angle in the northeast. The object gave off no sound and the color remained a brilliant white. Mrs. Tessmer told me that the object moved very slowly in an easterly direction and remained almost stationary for several minutes before proceeding in a northerly direction and finally fading from view.

All of the witnesses observed the bright cluster of lights through a pair of Sears 10x50mm Wide Angle Binoculars once they were outside. Mrs. Tessmer said that the object took on the shape of a circular relatively flat disk with lights surrounding its outer perimeter. The witness advised that the object was observed by herself, Alan and Ann for a period of approximately 20 minutes from the backyard.

Mrs. Tessmer stated that she had checked with a number of the neighbors that day and none of them had seen anything. This is not surprising considering the time of the sighting. Mrs. Tessmer is presently working as a real estate broker and her husband Robert is employed by the city of Phoenix in the Title Section. Mr. Tessmer was unable to see more than a bright glare at the time of the sighting since he had just taken drops for his Glaucoma.

Mrs. Tessmer said that she has always believed that UFOs possibly existed; however, she had her belief reinforced on the early morning of July 22, 1974.

The weather conditions on the morning of July 22, 1974 were as follows: Wind out of the northwest at 6 mph, Humidity 79%, Temperature 77, Clear Sky.

I was unable to obtain information as to the relative position of the moon and the planet Venus and Jupiter, which would be the only celestial bodies that could come at all close to producing enough light which could be interpreted as a UFO; however, I believe that the observable motion of the object with the eye and appearance when viewed with binoculars rules out one of these.

The witness could not recall the apparent size of the object by the normal comparative means used by those investigating in the field nor could she recall the area that the object filled in the field of view of the binoculars so it would be rather difficult to determine the size or altitude or distance of the object from the witness.

Mrs. Tessmer gave me the phone number of a Mrs. Harold Banta, who lives at 7018 West Highland Avenue, Phoenix, Arizona. Mrs. Banta had read the article carried by the Phoenix Gazette on July 26, 1974 and had called Mrs. Tessmer to advise her that she had also witnessed an

object at approximately 4:20 a.m. on the morning of July 22, 1974.

I called Mrs. Banta and she informed me that she was taking her dog for its morning constitutional and noticed an extremely bright bluish white light in the northeastern sky. She observed the object, which was moving quite slowly, for approximately 20 minutes and then went into the house. Her husband was asleep at the time and she did not want to awake him. She asked her husband that day if the object could have been some type of weather device? However, he informed her that to the best of his knowledge he didn't believe so. Mr. Banta is in the Air Force.

I contacted the Maricopa County Sheriff's Department, Scottsdale Police Department and Paradise Valley Police Department and was unable to get confirmation in regard to calls that came in on that date.

W. J. Hart  
Field Investigator

\* \* \* \* \*

## MAKING TEMPORAL ESTIMATES AND MEASUREMENTS\*

(Part III)

Richard F. Haines, Ph.D.

This is the third in a series of brief articles on standardization of terms, concepts, and procedures related to the perception of unidentified flying objects (UFO). Anyone who reports a sighting and is interviewed is asked, "When did it occur?" and "How long did it last?" As we will see, such information is very important. Indeed, as one researcher has put it, "Le temps, n'est-il pas le phenomene fondamental de l'existence?" (ref. 1). Accurate temporal measurements can be of significant value to those who analyze UFO field investigation reports by helping them: (1) establish some idea of object velocity (discussed below), (2) evaluate the possibility that observers at different geographic locations may have witnessed the same object, and (3) draw a variety of other conclusions about the object (e.g., similarities, differences, qualitative/quantitative features) and about the observer(s) (e.g., their credibility).

### What is Time?

The word "time" has many dictionary definitions and scores of hyphenated uses. And scores of scholarly books and articles have been written on this elusive subject. I believe that the basic idea of time, at least for Western Culture Man, is "the relation on the continuum of (physical) existence that any event has to any other event." Because the word time

means different things to different people, it is vitally necessary to be consistent in our usage.

Since most of us wear wristwatches, we should try to keep them accurately set to local time. To help you do this most telephone companies provide an automated time reference service to an accuracy of about one second. However, during and/or after the usually high emotional excitement of a UFO sighting, one may totally forget to check his watch. In this case a much less accurate estimate of the total duration or coincident time of the sighting may be obtained by mental associations with other concurrent events such as a passing aircraft, chiming church bell, train whistle, radio program, etc. The "Recommended Procedures for APRO Field Investigators (1972 edition) states that "The most important factor for the Field Investigator to explore is the time uncertainty." This document recommends that the field investigator time the UFO observer as he duplicates all motions of the object and determine the limits of timing error by asking what was the "earliest possible time and the latest possible time of the initial visual contact . . . All timings can be bracketed by requesting that the witness re-live the sighting again while he duplicates all motions somewhat 'too slowly' and then again 'too quickly'. In this fashion a rough indication can be made about the certainty of the duration of the sighting." (Ibid., pg. 5)

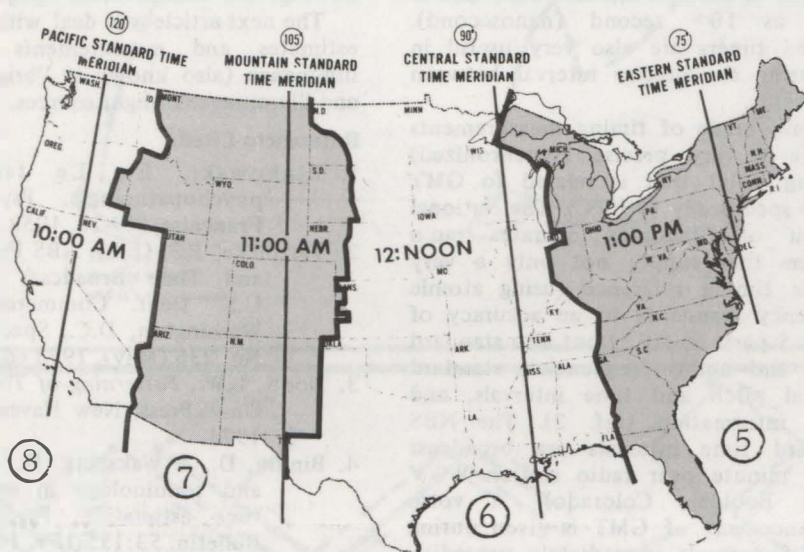
But what about reporting time consistently? It is strongly recommended that all UFO field investigators and those who analyze such data adopt the 24-hour clock notation that is used in civil and military aviation and by others. Such usage would help eliminate a.m. — p.m. ambiguities, would tend to save space on field investigation forms, and would save computer card punching efforts. The 0- to 24-hour system is used starting with 0000 for midnight at the Greenwich (pronounced Grenich) Meridian (longitude zero). The first two figures give the hour; the last two figures give the number of minutes past the hour. Briefly, the idea is to convert the local time of a sighting into its corresponding Greenwich Mean Time (GMT); also called "Z" time. GMT and Z time are now accepted as the general equivalents of "Universal Time Corrected" (UTC) that is maintained by the National Bureau of Standards and is used in navigation and communication (ref. 2, pg. 3). Figure 1 is presented to help you make this time conversion if you live within the 48 conterminous states of the United States. The circled numbers above each zone represent the number of degrees arc (West of Greenwich, England) upon which each of the four U.S. time



## "Estimates"

(Continued from Page Four)

zones are based. Since the Earth makes one revolution of 360° a day (24 hours), one hour is equivalent to 15° of Earth rotation. Each time zone is separated by rather irregular boundaries; the Eastern and Mountain time zones are shaded. When daylight savings time is in effect (generally *between* the last Sunday in February and the last Sunday in October), the sun at noon is directly above the 75th (Eastern time zone) rather than the 90th (Central time zone) meridian. Therefore, if a UFO sighting is made in Missouri at 1200 hrs. (i.e., noon) CST (Central Standard Time), the corresponding GMT would be simply 90° divided by 15° or 6 hours earlier = 1800 GMT. Care must be taken to account for date changes (due to the sun's passage above the International Date Line). Referring again to Figure 1, the small number given *below* each time zone is the number of hours that zone is different from Greenwich time. All values are negative because the Earth rotates from East to West.



### Making Temporal Estimates:

The primary distinction between temporal estimates and measurements is more likely to be who makes them rather than the degree of accuracy attained. Thus, the UFO observer is more likely to make time estimates rather than obtain accurate temporal measurements of the beginning, end, and duration of his sighting. The UFO field investigator, on the other hand, should be prepared to measure a given event with an accuracy of at least a second or better depending upon the nature of the event. A good general rule is always:

BE AS ACCURATE  
AS YOU CAN WHEN ESTIMATING  
OR MEASURING TIME

We tend to take time so much for granted that environmental stressors, social distractions, mental activity, etc., make us forget what time it is. This lapse can be partially overcome with practice as can your ability to judge the passage of time over relatively short periods. Try the following simple self-calibration experiment: (a) Ask a friend to say "go" when the sweep second hand of his watch is at 12. You should say "stop" when you think 15 seconds has elapsed. Your friend should then record the actual number of seconds elapsed when you responded. Do this eight or ten times and calculate the mean estimated time. (b) Repeat this procedure using a 30-second-long period. (c) Repeat the above procedure using increasingly longer estimate intervals, keeping track of the actual *and* estimated times. As you lengthen this estimate interval, you should find an interval where your estimation errors are smallest. As the timed interval is lengthened beyond this "critical duration," your errors will again increase in size. This can be done in less than an hour, it should be fun, and it should tell you something about your own ability to estimate the passage of time. Of course, many

investigators have studied this subject, and the interested reader may want to study it further (cf. refs. 3-5).

The ability to estimate and measure instants in time is also very important in the study of UFOs. Table 1 has been prepared to illustrate the importance of making temporal estimates and measurements as accurately as possible. For these calculations it has been assumed that an object is travelling in straight and level flight at a constant velocity. The object passes directly above point (A) at time  $t_1$  and, later, above point (B) at time  $t_2$ , which is (D) miles away. A distance (D) of 100 miles is used here. Time  $t_1$  and  $t_2$  should be expressed in GMT. Several useful formulae are provided here for future use. If the

velocity (V) of the object is going to be calculated from these values, the magnitude of the error in V (hereafter called  $\Delta V$ ) can be attributed to errors in measuring distance D (called  $\Delta D$ ) and the size of the timing errors made at time  $t_1$  and  $t_2$  (called  $\Delta t$ ; where  $t = t_2 - t_1$ ). Assuming that the time at (A) is too late (i.e., the object has already passed over) and/or too early at (B), then  $\Delta V$  is related to  $\Delta D$  and  $\Delta t$  by the simple formula:

$$\Delta V = \frac{(D + \Delta D)(\Delta t)}{t(t - \Delta t)} \quad 1.$$

For the special case where D is known precisely, this formula reduces to:

$$\Delta V = \frac{(D)(\Delta t)}{t(t - \Delta t)} \quad 2.$$

And, if both D and V are known, then:

$$\Delta V = V \frac{\Delta t}{\frac{D}{V} - \Delta t} \quad 3.$$

In order to calculate the percentage error that is introduced when a timing error (E) is made at both (A) and (B), the following formula can be used:

$$\Delta E = \frac{\Delta V}{\frac{D}{t}} \times 100. \quad 4.$$

The values given in Table 1 show that for higher "actual" object velocities, even small timing errors can result in large errors in "calculated" object velocity, which is not particularly surprising. Nevertheless, the sometimes very high reported velocities of some UFOs tracked on radar (say 1000 mph) can be grossly mis-estimated with relatively small timing errors at two different ground locations. The  $\Delta V$  values given in Table 1 should be *added* to the ft/sec value for that row to find "calculated" V for a late timing at (A) and/or an early timing error at (B). If the timing at (A) is too early and/or too late at (B), then the  $\Delta V$  value from the following formula (5) should be *subtracted* from the ft/sec value for that row to find "calculated" V.

$$\Delta V = \frac{D(\Delta t)}{t(t + \Delta t)} \quad 5.$$

The above assumed conditions are seldom (if ever) known for sure; this illustration is meant to demonstrate the importance that only a few seconds error can have in determining object velocity.

Regarding more psychological factors in time perception, a growing number of laboratory studies on time estimation are showing just how much people vary in

(See "Estimates" - Page Six)



## Estimates

(Continued from Page Five)

estimating the passage of time. One study (ref. 6) examined the influence of performing various kinds of tasks lasting from 50 to 150 seconds upon temporal judgment. Those test subjects given nothing to do for 50 seconds tended to overestimate the 50-second-long interval while those subjects instructed to perform a mechanical ability task for either 100 or 150 seconds tended to underestimate these intervals. Male subjects were not found to be different from female subjects in their accuracies. Another study asked 30 men, women, and children to estimate the time of day with no clocks or other time references present while confined for 304.6 hours in a fallout shelter (ref. 7). It was found that morning estimates (0900 hrs) were slightly more accurate than evening estimates (2100 hrs). The 0900 estimates ranged from 72.6 min under- to 32.8 min overestimation; the 2100 estimates ranged from 31.2 min over- to 185.9 min overestimation. People from 24 to 38 years of age were most accurate. Another investigator (ref. 3) summarized several general features of visual and auditory perception related to temporal duration perception as follows: (1) two sensory stimuli can be discriminated as being separate if they are about 0.16 sec apart for visual flicker discrimination, 0.001 sec apart for noise, and 0.002 sec apart for tones; (2) the presentation order of two sensory stimuli can be correctly discriminated if one precedes the other by about 0.02 sec (for 75% correct response) regardless of the sense organ stimulated; (3) the duration at which time is neither under nor overestimated most of the time seems to be about 0.75 sec ( $\pm$  0.25 sec); however, this "indifference zone" is highly variable and continues to be in dispute; and (4) people perceive the "psychological present" as a single event with an interval lasting anywhere from 2 to 12 seconds! The interested reader should consult refs. 3-5 for further information on this important subject.

### Making Temporal Measurements:

A wide variety of time measuring and recording instruments are available today to fit almost any need and most pocket books. Most relatively inexpensive (spring wound) wristwatches are accurate to about a minute per day (often longer) and more expensive battery operated, crystal frequency stabilized "time pieces" (wristwatches) are significantly more accurate than this. Wristwatches are also available with "stop watch" and other specialized timing capabilities. Laboratory timing/recording instruments are also available in kit or built-up form

TABLE 1

Calculated Object Velocity Error (ft/sec)  
Based upon Two Separate Timing  
Errors as Described in Text

Actual Object Velocity	Units	Size of Timing Error (sec) at Point (A) and (B) <sup>1</sup>			
		$\pm$ - 1 sec	$\pm$ - 10 sec	$\pm$ - 30 sec	$\pm$ - 60 sec
1 mph 1.467 ft/sec	$\Delta V$ ft/sec E %	$4.07 \times 10^{-6}$ $2.78 \times 10^{-4}$	$4.07 \times 10^{-5}$ $2.78 \times 10^{-3}$	$1.22 \times 10^{-4}$ $8.34 \times 10^{-3}$	$2.45 \times 10^{-4}$ $1.67 \times 10^{-4}$
50 mph 73.3 ft/sec	$\Delta V$ ft/sec E %	0.010 $1.39 \times 10^{-2}$	0.102 $1.39 \times 10^{-1}$	0.307 $4.18 \times 10^1$	0.616 $8.40 \times 10^{-1}$
100 mph 146.7 ft/sec	$\Delta V$ ft/sec E %	0.041 $2.78 \times 10^{-2}$	0.408 $2.78 \times 10^{-1}$	0.252 $8.40 \times 10^{-1}$	2.487 1.70
500 mph 733.3 ft/sec	$\Delta V$ ft/sec E %	1.02 $1.39 \times 10^{-1}$	10.33 1.41	31.88 4.3	66.67 9.1
1000 mph 1467 ft/sec	$\Delta V$ ft/sec E %	4.08 0.27	41.92 2.86	133.4 9.1	293.5 20
5000 mph 7333.3 ft/sec	$\Delta V$ ft/sec E %	103.3 1.4	1182.8 16.13	5238.1 71.4	36666.7 500

Note: 1, V values from formula 2 and are expressed in ft/sec.  
E values from formula 4 and are expressed in % of  
actual object velocity.

and can be used to measure durations as short as  $10^{-9}$  second (nanosecond). Elapsed timers are also very useful in measuring the precise interval between two events.

Some kinds of timing measurements require a very precise (synchronized) starting point that is related to GMT (more specifically to UTC). The National Bureau of Standards operates radio stations that supply not only a very precise timing reference (using atomic frequency standards to an accuracy of about 5 parts in  $10^{13}$ ) but also standard radio and audio frequencies, standard musical pitch and time intervals, and other information (ref. 2). The NBS standard time intervals are broadcast every minute over radio station WWV (from Boulder, Colorado). A voice announcement of GMT is given during the 7.5 seconds immediately preceding the minute. "Just before 1035 GMT, for instance, the voice announcement (given in English) is: 'At the tone - ten hours, thirty-five minutes Greenwich Mean Time'." (ref. 2, pg. 3)

The whole subject of time and its measurement is extremely complex and cannot be treated in any depth in a brief article such as the present one. Each field investigator will want to develop his own procedures and equipment for measuring time. It should also be encouraged that these timing instruments be accurately compared and set (calibrated) against even more accurate time standards (e.g., NBS standards just discussed). Perhaps one role that the newly formed Center for UFO Studies might play is to provide the expertise and required instrumentation for calibrating field

investigators' measurement equipment.

The next article will deal with making estimates and measurements of the luminance (also known as "brightness") and illuminance of light sources.

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